§ 91.509(e). In the event a retest is performed, a request may be made to the Administrator, within ten days of the end of the production quarter, for permission to substitute the after-repair test results for the original test results. The Administrator will either affirm or deny the request by the engine manufacturer within ten working days from receipt of the request.

§ 91.508 Cumulative Sum (CumSum) procedure.

(a) Manufacturers must construct the following CumSum Equation for HC+NO$_X$ for each engine family. Test results used to calculate the variables in the CumSum Equation must be final deteriorated test results as defined in § 91.509(c).

$$C_i = \max[0 \; 0R \; (C_{i-1} + X_i - (FEL + F))]$$

Where:

C_i = The current CumSum statistic
C_{i-1} = The previous CumSum statistic. Prior to any testing, the CumSum statistic = 0 (i.e. $C_0 = 0$)
X_i = The current emission test result for an individual engine
FEL = Family Emission Limit
$F = 0.25 \; x \; \sigma$

After each test, C_i is compared to the action limit, H, the quantity which the CumSum statistic must exceed, in two consecutive tests, before the engine family may be determined to be in noncompliance for purposes of § 91.510.

H = The Action Limit. It is 5.0 x σ, and is a function of the standard deviation, σ.
σ = is the sample standard deviation and is recalculated after each test.

(b) After each engine is tested, the CumSum statistic shall be promptly updated according to the CumSum Equation in paragraph (a) of this section.

(c)(1) If, at any time during the model year, a manufacturer amends the application for certification for an engine family as specified in paragraph (a) of § 91.122 by performing an engine family modification (i.e. a change such as a running change involving a physical modification to an engine, a change in specification or setting, the addition of a new configuration, or the use of a different deterioration factor) with no changes to the FEL, all previous sample size and CumSum sta-

tistic calculations for the model year will remain unchanged.

(2) If, at any time during the model year, a manufacturer amends the application for certification for an engine family as specified in paragraph (a) of § 91.122 by modifying its FEL as a result of an engine family modification, the manufacturer must continue its calculations by inserting the new FEL into the sample size equation as specified in § 91.506(b)(1) and into the CumSum equation in paragraph (a) of this section. All previous calculations remain unchanged. If the sample size calculation indicates that additional tests are required, then those tests must be performed. The CumSum statistic recalculation must not indicate that the family has exceeded the action limit for two consecutive tests. The manufacturer's final credit report as required by § 91.210 must break out the credits that result from each FEL and corresponding CumSum analysis for each FEL set.

(3) If, at any time during the model year, a manufacturer amends the application for certification for an engine family as specified in paragraph (a) of § 91.122 by modifying its FEL without performing an engine modification, all previous sample size and CumSum statistic calculations for the model year must be recalculated using the new FEL. If the sample size calculation indicates that additional tests are required, then those tests must be performed. The CumSum statistic recalculation must not indicate that the family has exceeded the action limit for two consecutive tests.

(4) If, at any time after the end of the model year but prior to the manufacturer's final credit report submittal as specified in § 91.210, a manufacturer changes an FEL for an entire family, or for an affected part of the year's production, as specified in paragraph (a) of § 91.122, in cases where there were one or more mid-year engine family modifications, all previous sample size and CumSum statistic calculations for the model year, or part of the model year affected by an engine family change, must be recalculated using the new FEL. The sample size equation must not indicate a larger number of

tests than were appropriately performed using the previous FEL and the CumSum statistic recalculation must not exceed the action limit in two consecutive tests. The manufacturer's final credit report as required by § 91.210 must break out the credits that result from each FEL and corresponding CumSum analysis for each FEL set.

§ 91.509 Calculation and reporting of test results.

(a) Initial test results are calculated following the applicable test procedure specified in paragraph (a) of § 91.507. The manufacturer rounds these results, in accordance with ASTM E29–93a, to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure. (ASTM E29–93a has been incorporated by reference. See § 91.6.)

(b) Final test results are calculated by summing the initial test results derived in paragraph (a) of this section for each test engine, dividing by the number of tests conducted on the engine, and rounding in accordance with ASTM E29–93a to the same number of decimal places contained in the applicable standard expressed to one additional significant figure.

(c) The final deteriorated test results for each test engine are calculated by applying the appropriate deterioration factors, derived in the certification process for the engine family, to the final test results, and rounding in accordance with ASTM E29–93a to the same number of decimal places contained in the applicable standard expressed to one additional significant figure.

(d) If, at any time during the model year, the CumSum statistic exceeds the applicable action limit, H, in two consecutive tests, the engine family may be determined to be in noncompliance and the manufacturer must notify EPA within two working days of such exceedance by the CumSum statistic.

(e) Within 30 calendar days of the end of each quarter, each engine manufacturer must submit to the Administrator a report which includes the following information:

(1) The location and description of the manufacturer's or other's exhaust emission test facilities which were utilized to conduct testing reported pursuant to this section;

(2) Total production and sample sizes, N and n, for each engine family;

(3) The FEL against which each engine family was tested;

(4) A description of the process to obtain engines on a random basis;

(5) A description of the test engines;

(6) For each test conducted,

(i) A description of the test engine, including:

(A) Configuration and engine family identification,

(B) Year, make, and build date,

(C) Engine identification number, and

(D) Number of hours of service accumulated on engine prior to testing;

(ii) Location where service accumulation was conducted and description of accumulation procedure and schedule;

(iii) Test number, date, test procedure used, initial test results before and after rounding, and final test results for all exhaust emission tests, whether valid or invalid, and the reason for invalidation, if applicable;

(iv) A complete description of any adjustment, modification, repair, preparation, maintenance, and/or testing which was performed on the test engine, was not reported pursuant to any other paragraph of this subpart, and will not be performed on all other production engines;

(v) A CumSum analysis, as required in § 91.508, of the production line test results for each engine family;

(vi) Any other information the Administrator may request relevant to the determination whether the new engines being manufactured by the manufacturer do in fact conform with the regulations with respect to which the certificate of conformity was issued;

(7) For each failed engine as defined in § 91.510(a), a description of the remedy and test results for all retests as required by § 91.511(g);

(8) The date of the end of the engine manufacturer's model year production for each engine family; and

(9) The following signed statement and endorsement by an authorized representative of the manufacturer: